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ABSTRACT

The impact of liberal arts and professional programs on student outcomes variables was studied. Data were gathered from the 1975 entering freshman cohort at the University of Colorado at Boulder through a 1975 Freshman Questionnaire and a 1979 Graduating Students Survey. Program impact was measured using a model developed by Astin. Type of program was found to have at least some impact on 14 variables which also showed clear overall patterns of change over time and on which there were important output (senior year) differences by program type. The general picture which emerged is the suggestion that the college experience for professional program students had a somewhat focusing and narrowing effect while for liberal arts students it appeared to have a more broadening effect. Substantial benefits for the liberal arts students were indicated. (Author/SW)

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A LONGITUDINAL STUDY OF STUDENT OUTCOMES AT A STATE UNIVERSITY

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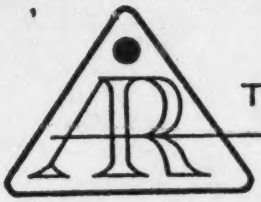

THE ASSOCIATION FOR INSTITUTIONAL RESEARCH

This paper was presented at the Twentieth Annual Forum of the Association for Institutional Research held at the Peachtree Plaza Hotel in Atlanta, Georgia, April 27 - May 1, 1980. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum papers.

Mary Corcoran
University of Minnesota
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ABSTRACT

This study examined the impact of liberal arts and professional programs on a number of student outcomes variables. Outcomes data were gathered from the 1975 entering freshman cohort at the University of Colorado at Boulder through a 1975 Freshman Questionnaire and a 1979 Graduating Students Survey. Program impact was measured using a model developed by Astin. Type of program was found to have at least some impact on fourteen variables--variables which also showed clear overall patterns of change over time and on which there were important output (senior year) differences by program type. The data from this study indicate that there were substantial benefits for the liberal arts students.

INTRODUCTION

Many educators believe that the liberal arts provide broad, long-term, non-quantifiable types of educational benefits. These include the development of creativity, leadership, critical thinking skills and flexibility; an understanding of culture and the arts; and a sense of citizenship. On the other hand, professional programs are seen as offering skills directly related to advancing technology and the world of work. This is not to say that there is an absolute dichotomy between the liberal arts and professional programs. For example, many of the latter require liberal arts courses. Both kinds of programs must obviously interact in order for students to develop meaningful careers, achieve personal satisfaction, and attain important life goals.

A number of investigators have compared the educational outcomes of different types of college programs. However, only a few have examined the impacts of liberal arts and professional programs on outcomes changes. For instance, Franks, Falk and Hinton (1973) showed that changes in value statements differed for sociology (liberal arts) and business (professional) students. The former showed a greater increase in liberalism and less of an increase in self-determinism when compared to the latter. Huntley (1965) examined changes in the values of students in various academic majors. Among his results was the finding that humanities students showed greater increases in their aesthetic values than those in other fields including engineering. Thistlethwaite (1962) found that differences existed among students in their aspirations for obtaining an advanced degree. Sex, intellectual orientation, and field of study were found to be related to increases in aspirations, even after initial aspiration levels were controlled. Students in the liberal arts generally showed greater increases in aspiration compared to those in education and business.

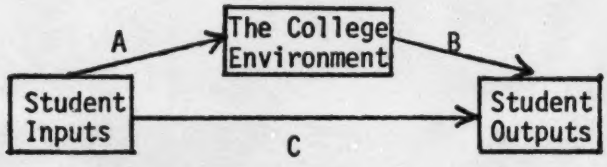
Exceptions to this pattern were reported for majors in languages, political science, and biology.

Some studies have compared the impacts of liberal arts and professional programs without examining outcomes changes. For example, Bisconti and Solmon (1976: 12-13) compared the responses of graduates in business, education, and engineering with those in the humanities and social sciences. A higher percentage of the latter reported that their education was useful for increasing general knowledge, while a higher percentage of the former reported that their education taught them job-related skills and increased their chances of finding a good job. There were few differences on the variables of leadership and ability to think clearly. Lehmann (1965) examined curricular differences among freshman in cognitive skills and in attitudes and values. He found that arts and sciences students were higher in critical thinking ability, reading comprehension, and general academic aptitude than students in other fields including engineering, education, and business. After controlling for these three cognitive variables, he found that arts and sciences students were more flexible, adaptive, easy-going, and open to new ideas and were less stereotypic and dogmatic than students in other fields.

All of the above studies found some evidence of the differential impact of the liberal arts and professional programs. Students in the liberal arts were more flexible and receptive to new ideas; acquired more general knowledge; became more politically liberal; increased in their aesthetic values; and (with some exceptions) increased in their aspirations for advanced degrees relative to students from professional programs. However, the latter were higher on job-related variables.

College programs facilitate significant affective and cognitive development in students, and differences in curriculum, teaching, educational climate, and student-faculty relationships clearly have differential impacts (Chickering, McDowell, and Campagna, 1969). However, it is difficult to measure the true impacts of programs on students without a noncollege control group of similar persons who do not attend college. One alternative is to examine changes among similar students who enter different kinds of college environments (Feldman and Newcomb, 1969). Feldman and Newcomb (1969), Astin and Panos (1969), Huntley (1965), and Pace (1979) argue that studies which examine "change" in student outcomes should be longitudinal in nature and control for initial student differences. Differences in program impact on students cannot be interpreted if specific programs attract students with differing abilities and levels of motivation (Chickering et al, 1969).

One approach to the measurement of program impact is the model presented by Astin (1970). This model has three components: 1) student outputs, 2) student inputs, and 3) the college environment. Outputs include academic achievement, student satisfaction, self-evaluation of skills, extent of perceived progress toward students' goals, extracurricular activities, etc. Student inputs include academic ability, demographic characteristics (socioeconomic status, sex, etc.), attitudes and values, motivation, potential for growth and achievement, etc. The college environment includes the type of program as well as student-faculty interaction, faculty values, peer values, etc. The relationships between these components are diagrammed below.



The present study used Astin's model to assess the impact of college environment (i.e. type of program) on student outputs (B)[1]. However, student inputs also impact student outputs (C). In addition, the college environment is affected by student inputs (A). The impact of college environment on student outputs can be isolated only by controlling the other two relationships.

STUDY DESIGN AND SAMPLE CHARACTERISTICS

This research is a product of the Student Outcomes Model at the University of Colorado which was developed in 1975 to examine the impact of institutional programs on student outcomes (Endo and Lenning, 1978). The Model provides a structure for the systematic collection of student data through the use of surveys. The information gained through these surveys is used for needs assessment, program development, resource allocation, and evaluation. These surveys include variables related to students' background, attitudes, values, goals, abilities, and the extent of change in these variables. The Model consists of five basic questionnaires: 1) Freshman Questionnaire, 2) Educational Experience Survey, 3) Exiting Students Survey, 4) Graduating Students Survey, and 5) Alumni Survey. The Model allows for longitudinal and cross-sectional analysis. A complete cycle of surveys is administered every two years.

This particular study examined changes in undergraduate students after four years at the University of Colorado at Boulder. Change was examined on a set of student outcomes variables appearing on the Freshman Questionnaire and the Graduating Students Survey. These variables were developed from an

extensive search of the literature and from items provided by the Higher Education and Evaluation KIT of the Center of the Study of Evaluation, University of California at Los Angeles (Pace, 1971).

Seventy-five percent of the entering fall 1975 freshmen (n=3,773) at the University completed a Freshman Questionnaire which provided information on their family background, present and future plans, expectations, methodology orientation, personal and social orientation, self-evaluations of ability in particular skills, importance of goals for attending college, educational orientation, and extracurricular activities. In addition, demographic and academic data from institutional records on each student were combined with their survey responses.

Four years later in the spring 1979 term, a Graduating Students Survey was sent to a sample of 480 seniors who were scheduled to graduate in May. The Graduating Students Survey contained many of the same items as those in the Freshman Questionnaire. Sixty-five percent of the sampled seniors (n=311) completed the Graduating Students Survey. Table 1 shows the background characteristics of these respondents and compares them with all the members of the 1975 freshman cohort who actually graduated in May 1979. The survey respondents were representative of the total cohort in terms of sex, ethnicity, field of study, and academic ability. There was a higher percentage of residents among the respondents (62%) than among the total cohort (54%). Liberal arts students were those whose majors were in the College of Arts and Sciences while professional program students were those from the College of Business and Administration, College of Engineering, College of Environ-

mental Design, College of Music, School of Education, School of Journalism, and School of Pharmacy.

Table 1 about here

DATA ANALYSIS AND RESULTS

A number of items which appeared on both the Freshman Questionnaire and the Graduating Students Survey were conceptually designed to be combined into scales which would measure variables such as the importance of goals for attending college and personal and social orientation. These items were factor-analyzed separately for each survey to determine if they would cluster according to their conceptually appropriate dimensions. Initial factors were extracted using a least squares approach (principal axis factoring with iteration), and factors with eigenvalues greater than 1.0 were rotated according to a varimax criterion. The results of the two factor analyses were almost identical in that both sets of items tended to cluster in the same way. This similar patterning of relationships provides some confidence in that these items measured the same attributes at two different points in time. Factor-based scales were constructed using the factors generated from the Graduating Students Survey. Items were used only if they had rotated loadings of at least .40 and also had rotated loadings of at least .40 on the corresponding factor from the analysis of the Freshman Questionnaire. This method of

constructing scales used only characteristic items rather than all items irrespective of the size of their factor loadings (Kim and Mueller, 1978: 70-72). Figure 1 shows the items that made up the resulting 13 scales.

Figure 1 about here

Many other items which appeared on both questionnaires but were not designed to be combined into scales were used as individual variable indicators Finally, one background variable, academic ability, was measured by a two-item index consisting of a respondents' first semester grade point average at the University and their composite score on the American College Tests (ACT); and another background variable, socioeconomic status, was measured by a three-item index consisting of father's education, father's occupation, and family income.

The remainder of the data analysis was conducted in three steps. First, the overall patterns of increases or decreases on each variable were examined by calculating changes in responses between the Freshman Questionnaire and the Graduating Students Survey for liberal arts and professional program students and for the sample as a whole. These general patterns were examined statistically using t-tests. To simplify further analysis, variables were retained only if they exhibited at least one statistically significant pattern of change ($p<.05$)[2]. The means and standard deviations for these variables appear in Table 2.

Table 2 about here

The second step of the analysis examined the impact of type of program on the variables retained from step one above. Following Astin's (1970) model presented earlier, the relationships between college environment (i.e. program type) and specific student outputs (i.e. retained variables as measured from the Graduating Students Survey) were investigated after controlling for the relationship between student inputs and college environment and the relationship between student inputs and student outputs. In this study, student inputs included the corresponding variables as measured from the Freshman Questionnaire and the important student attributes of sex, socioeconomic status, and academic ability. Partial correlations were calculated for the relationship between program type and the various outputs controlling for student inputs. Outputs with statistically significant partials ($p < .05$) appear in Table 3 and were retained for further analysis.[3]

Table 3 about here

The third step of the analysis investigated the magnitude of the two program's effects on the outputs retained from step two above (Astin, 1970). Input variables were regressed on these outputs and mean residuals were then computed separately for each program. These residuals appear in Table 3 along with t-tests for differences by program.

Table 3 contains 14 variables on which program type had at least some impact. In looking at the general patterns of change for these same 14 varia-

bles in Table 2, the values on most of these appeared to have increased between the Freshman Questionnaire and the Graduating Students Survey. When examining the latter (the outputs) by program, the following differences are apparent. Students in the professional programs placed greater emphasis on obtaining marketable skills than those in the liberal arts. This is consistent with findings from Thistlethwaite (1962). On the other hand, liberal arts students placed greater emphasis on goals for understanding the social sciences and applying knowledge to new situations.

Students from the professional programs were more likely to prefer solving complex problems while liberal arts graduates showed greater appreciation for original work and more interest in the process of solving problems (a scale which includes formulating hypotheses, enjoying new problems to solve, seeking the best answer, observing how things work, and seeking knowledge for its own sake).

As for the development of self-confidence, professional students were more likely to try to conform to what other people expected of them in order to be well-liked. Professional students also had greater confidence in their ability to find a good job.

Liberal arts students reported reading more novels and becoming more interested in science than professional program students. However, the latter reported higher values on participation in special interest groups, initiative in giving directions in group activities, and importance of developing leadership skills.

Finally, liberal arts students valued the importance of cultural goals (a scale which includes understanding the humanities, developing cultural understanding, developing creativity, and developing tolerance and understanding for different cultures) more than those in professional programs.

The above comparisons of outputs by program type have a number of important implications. For instance, it is not surprising that professional program students placed more emphasis on gaining marketable skills than those in the liberal arts. But while the former also had greater confidence in their ability to find a good job, the latter, as a group, were not necessarily pessimistic. A partial explanation for this may be found in the fact that liberal arts students placed greater importance on the goal of applying general knowledge to new situations (as opposed to gaining specific skills). It could be that liberal arts students were not as convinced that the skills necessary to find a good job were as "specific" as professional program students felt they were.

As one might expect, liberal arts students placed greater emphasis than professional program students on the goal of understanding the social sciences and on the importance of cultural goals. It would therefore appear that faculty members in the social sciences and humanities have a special challenge when they encounter professional program students in their classes. To the extent that motivation or performance is related to interest, professional program students may have difficulty in sharing the same enthusiasm for these courses as the liberal arts students.

Professional program students attributed more importance to the goal of developing leadership skills than liberal arts students. Professional program students also made more use of leadership skills in that they reported higher

levels of extracurricular activity in special interest groups and greater initiative in giving directions in group activities. In contrast to these results is the finding that professional students were more likely to conform to the expectations of others in order to be well-liked. This raises the interesting possibility that conformity may have been a partial price to pay for the attainment of leadership positions.

Finally, liberal arts students had higher values pn the problem-solving scale than professional program students, although the latter had a greater preference for solving complex problems. It may well be that liberal arts students found greater enjoyment in thinking about problems from various points of view, while professional program students preferred to reach solutions and were less interested in why a particular solution was correct or what other solutions might have been possible.

CONCLUSION

This study has demonstrated that type of program had at least some impact on 14 specific outcomes variables--variables which also showed some clear overall patterns of change over time and on which there were output differences by program type. The general picture which emerges is the hint that the college experience for professional program students had a somewhat focusing and narrowing effect while for liberal arts students it appeared to have a more broadening effect. While it is difficult to determine specific reasons for these effects, two factors may have been important. Thistlethwaite (1962) reported a strong faculty press in business programs toward vocationalism, compliance, and social status, with a low press toward humanism. In contrast,

he found a strong faculty press in the liberal arts toward humanism, independence, and enthusiasm, and a low press toward compliance and vocationalism. To the extent that such faculty values might have existed at the University and were shared in the classroom or that faculty served as role models, it would appear that such differential values were adopted by the students in this study.

Another influence might have been due to the relatively isolated nature of professional programs within the University. In many programs, the interaction with students from other majors becomes more and more limited as professional program students progress through their studies. As juniors and seniors, virtually all of their coursework, classmates, and faculty members are related to their own major. The values of liberal arts courses, students, and faculty cannot easily be adopted by professional program students in this situation. This problem is complicated by the influence of accreditation requirements for professional programs. To the extent that liberal arts electives are minimized in relation to required courses in professional disciplines, contact with the values of liberal arts students and faculty will be restricted. One possible approach to this problem of segregation might be the introduction of more interdisciplinary liberal arts courses. Also, programs such as business or journalism need not be restricted just to majors.

This study has provided evidence of the impact of two types of programs. In doing so, it has underscored some of the benefits of both, particularly the liberal arts since their educational outcomes are often less obvious and perhaps more intangible. The apparent impact of the liberal arts on variables such as

cultural goals, the problem solving process, broadening of interest in several fields, respect for original work, and the application of general knowledge to new situations clearly supports the importance of these programs in higher education.

FOOTNOTES

1. Astin actually discussed the variable "college environment" within the context of multi-institutional research and was concerned with comparing the impacts of different types of colleges. Here we used this variable within the context of a single institution to facilitate comparison of the impact of two different types of programs.
2. We are aware of the problems of examining changes for liberal arts students, professional program students, and the sample as a whole by comparing variable values at two points in time. Such comparisons might: 1) conceal the exact nature of individual changes, 2) underestimate the true amounts of changes because of "ceiling" or "floor" effects, and 3) also not reflect the true amounts of changes because of regression effects. However we were only interested here in identifying variables which showed: 1) clear <u>overall</u> patterns of change for at least one of the above groups, and 2) statistically significant amounts of change for at least one of the above groups despite ceiling, floor, or regression effects. We did not intend in this study to make comparisons between types of programs <u>specifically</u> on the <u>amounts</u> or <u>directions</u> of changes on variables; therefore we looked for statistically significant overall patterns of change in step one only as a way of selecting variables to retain for step two. Also note that we controlled for initial value differences (and regression effects) in our examination of program impact in step two.
3. We are aware of the methodological difficulties of examining educational impacts and are also aware of the prevailing criticisms of Astin's model and procedures. For example, Werts and Watley (1969) prefer to regress output variables on student inputs and college environment in a single step analysis.

The resulting standardized partial regression coefficients reflect the respective independent contributions of inputs and environment on outputs. In a variation of this approach, Bohrnstedt (1969) and others argue that standardized regression coefficients (and also partial correlation coefficients) cannot be compared across samples as they are a function of sample variances; therefore, unstandardized regression coefficients are preferable as they are more stable. Astin (1970: 238-239), however, counters by raising several concerns about regression analyses including the fact that student inputs and college environment are usually not independent. Despite Astin's comments, we conducted two types of regression analyses as a check on our findings in step two. First, we regressed output variables on student inputs and college environment (i.e. program type) in a single step and examined the sizes of the standardized and unstandardized regression coefficients for environment. Then, we conducted two-step analyses (Astin, 1970: 237) in which student inputs were first permitted to enter the regression equations after which college environment was allowed to enter; we examined the increase in the amount of output variable variance explained by the addition of college environment in each equation. These two types of regression analyses satisfied us that we had identified output variables in step two of our overall data analysis on which college environment had at least some impact.

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Table 1

BACKGROUND CHARACTERISTICS OF THE SAMPLE RESPONDENTS

AND TOTAL 1975 FRESHMAN COHORT THAT GRADUATED IN MAY 1979

	Respondents (n=311)	Total Cohort (n=820)
Sex		
Men	46.9%	47.3%
Women	53.1	52.7
	100 %	100 %
Residency		
Resident	62.1%	54.1%
Nonresident	37.9	45.9
	100 %	100 %
Ethnicity		
White	92.3%	93.6%
Nonwhite/other	7.7	6.4
	100 %	100 %
Field of Study		
Professional	47.0%	43.2%
Liberal Arts	53.0	56.8
	100 %	100 %
First term Grade Point Average at the University of Colorado	2.93	2.99
Final Grade Point Average at the University of Colorado	3.19	3.14

Figure 1

ITEMS IN FACTOR-BASED SCALES

Cultural Goal

To understand the humanities
To develop cultural understanding
To develop creativity/talent
To develop sensitivity and tolerance for different cultures

Intellectual Goal

To develop skills for quantitative thinking
To be able to raise questions
To acquire skills for self-learning
To apply knowledge to new situations

Individualistic Goal

To develop independence, self-reliance
To develop identity, self-confidence, self-worth

Social Goal

To develop lasting friendships
To find a compatible spouse, prepare for a meaningful family life
To develop social skills for interpersonal relationship

Individual Self-Confidence

I am uncertain about what I am really like
My confidence in myself is strong enough so that it doesn't bother me if people don't like me
I seem to have a real inner strength in handling things
I feel I am a person of worth, on an equal plane with others

Social Self-Confidence

I find difficulty speaking before a group of people; my ideas are not communicated clearly or effectively
I feel awkward in social situations
I'm shy about making new friends

Religiousness

My religious beliefs are an important part of my life
I have participated in social action programs that were linked to my religious beliefs

Process of Problem Solving

I enjoy discovering new problems to think about
I like to seek the best possible answer, even if it takes a long time
I enjoy observing things and thinking about how they work or occur
I like to formulate my own hypothesis about things
I like to discover new ways of doing things
I enjoy seeking knowledge for its own sake

Critical Thinking Activities

I recognize assumptions behind an argument
I enjoy detecting faculty reasoning
I examine statements critically

Cultural Activities

Attended one or more stage plays or read a play
Visited an art gallery or museum or completed a sketch or painting
Read one or more contemporary novels
Attended a concert, theatre or exhibition which featured the art, music, or drama of another country, its race or ethnic group

Science Activities

Attended a scientific lecture or exhibit
I read a technical journal

Discussion of Politics, Philosophy, Culture

I discussed national and world political problems
I discussed philosophy or religion with friends
I talked with friends about people and cultural events of other countries, races or ethnic groups

Interest in Political Activities

I circulated a petition for a cause I believed in
I wrote a letter to a government official regarding some pending issue

Table 2

MEANS AND STANDARD DEVIATIONS FOR

OUTCOMES VARIABLES RETAINED IN STEP ONE OF THE ANALYSIS

Variables	Program	Freshman Questionnaire		Graduating Students Survey		T-Test
		Mean	S.D.	Mean	S.D.	
To obtain marketable skills	Professional	3.46	0.65	3.53	0.71	
	Liberal Arts	3.43	0.77	3.05	0.89	*
	Total	3.44	0.71	3.28	0.85	*
To raise questions, examine different views, and solve problems	Professional	3.68	0.50	3.54	0.61	*
	Liberal Arts	3.61	0.59	3.58	0.57	
	Total	3.64	0.55	3.56	0.59	*
To acquire skills for quantitative thinking	Professional	3.22	0.68	3.35	0.67	*
	Liberal Arts	3.31	0.68	3.23	0.77	
	Total	3.27	0.68	3.29	0.73	
To understand the humanities	Professional	2.97	0.82	2.61	0.88	*
	Liberal Arts	3.08	0.74	2.99	0.81	
	Total	3.03	0.78	2.81	0.88	*
To understand the social sciences	Professional	3.06	0.77	2.68	0.81	*
	Liberal Arts	2.92	0.84	3.08	0.80	*
	Total	2.98	0.81	2.89	0.83	
To acquire basic skills	Professional	3.11	0.90	3.07	1.08	
	Liberal Arts	3.02	0.80	3.24	0.96	*
	Total	3.06	0.85	3.16	1.02	
To apply knowledge to new situations	Professional	3.77	0.44	3.63	0.56	*
	Liberal Arts	3.67	0.53	3.75	0.46	
	Total	3.72	0.49	3.70	0.51	
To develop effective verbal communication	Professional	3.38	0.70	3.50	0.68	
	Liberal Arts	3.18	0.79	3.53	0.68	*
	Total	3.27	0.76	3.51	0.68	*
To develop an understanding for culture	Professional	2.88	0.85	2.72	1.02	*
	Liberal Arts	3.04	0.81	3.09	0.93	
	Total	2.97	0.84	2.91	0.99	
To develop a personal philosophy of life or religious belief	Professional	2.88	0.87	2.71	1.11	
	Liberal Arts	3.01	0.94	2.93	1.07	
	Total	2.95	0.91	2.83	1.09	*
To find a compatible spouse and prepare for a family life	Professional	2.23	0.97	1.86	0.91	*
	Liberal Arts	2.17	0.88	1.84	0.92	*
	Total	2.20	0.92	1.85	0.91	*
To develop social skills for interpersonal relationships	Professional	3.05	0.69	3.23	0.76	*
	Liberal Arts	3.01	0.72	3.22	0.83	*
	Total	3.03	0.70	3.23	0.80	*
To develop leadership	Professional	3.23	0.79	3.32	0.77	
	Liberal Arts	2.95	0.86	3.05	0.88	
	Total	3.08	0.84	3.18	0.84	*
To participate in political or social reform or change movements	Professional	2.25	0.82	1.92	0.92	*
	Liberal Arts	2.33	0.90	2.06	0.92	*
	Total	2.29	0.86	1.99	0.92	*

* $p < .05$

I argue different sides of an issue	Professional	2.77	0.91	2.78	0.92	*
	Liberal Arts	2.87	0.79	2.88	0.85	
	Total	2.82	0.85	2.83	0.88	*
I recognize assumptions behind an argument	Professional	3.04	0.67	3.24	0.71	*
	Liberal Arts	3.13	0.63	3.27	0.59	*
	Total	3.09	0.65	3.26	0.65	*
I enjoy searching for systematic relationships even when a solution is not apparent	Professional	2.78	0.81	3.25	0.68	*
	Liberal Arts	2.84	0.82	3.13	0.83	*
	Total	2.81	0.81	3.19	0.77	*
I enjoy solving complex problems	Professional	2.62	0.89	2.90	0.88	*
	Liberal Arts	2.45	0.84	2.59	0.89	
	Total	2.53	0.87	2.74	0.90	*
I enjoy detecting faulty reasoning	Professional	2.92	0.87	3.14	0.84	*
	Liberal Arts	2.87	0.91	2.99	0.82	
	Total	2.89	0.89	3.06	0.83	*
I enjoy examining contrary views	Professional	2.90	0.76	3.12	0.70	*
	Liberal Arts	3.01	0.73	3.21	0.79	*
	Total	2.96	0.74	3.17	0.75	*
I examine statements critically	Professional	2.81	0.69	3.04	0.68	*
	Liberal Arts	2.88	0.71	3.13	0.70	*
	Total	2.85	0.70	3.09	0.69	*
I question people when they present new ideas	Professional	2.92	0.78	3.09	0.71	*
	Liberal Arts	2.98	0.75	3.12	0.71	*
	Total	2.95	0.76	3.11	0.71	*
I like to contemplate the future of society	Professional	3.03	0.92	3.20	0.83	
	Liberal Arts	3.03	0.92	3.16	0.86	
	Total	3.03	0.92	3.18	0.84	*
I enjoy discovering new problems to think about	Professional	2.76	0.91	2.84	0.82	
	Liberal Arts	2.82	0.87	2.99	0.86	*
	Total	2.80	0.89	2.92	0.85	*
I like to seek the best possible answer even it takes a long time	Professional	2.92	0.79	3.07	0.75	*
	Liberal Arts	2.95	0.77	3.23	0.74	*
	Total	2.94	0.78	3.16	0.75	*
I enjoy observing things and thinking about how they work or occur	Professional	3.15	0.74	3.38	0.74	*
	Liberal Arts	3.32	0.71	3.49	0.65	*
	Total	3.24	0.73	3.44	0.69	*
I like to formulate my own hypothesis about things	Professional	2.99	0.76	3.09	0.80	
	Liberal Arts	3.05	0.79	3.22	0.74	*
	Total	3.02	0.78	3.16	0.77	*
I appreciate original work	Professional	3.44	0.65	3.54	0.60	
	Liberal Arts	3.50	0.67	3.73	0.48	*
	Total	3.47	0.66	3.64	0.55	*
I enjoy seeking knowledge for its own sake	Professional	3.13	0.76	3.22	0.83	
	Liberal Arts	3.29	0.73	3.41	0.69	
	Total	3.22	0.75	3.32	0.76	*
I prefer to draw my own conclusions	Professional	3.13	0.68	3.31	0.67	*
	Liberal Arts	3.23	0.68	3.35	0.62	
	Total	3.19	0.68	3.33	0.65	*
I enjoy speaking before a group or participating in class discussions	Professional	2.65	0.96	2.79	0.98	*
	Liberal Arts	2.68	1.05	2.67	1.02	
	Total	2.67	1.01	2.73	1.00	

I find difficulty speaking before a group; my ideas are not communicated clearly or effectively	Professional	2.18	0.92	2.03	0.97	
	Liberal Arts	2.26	1.03	2.06	0.95	*
	Total	2.22	0.98	2.05	0.96	*
In order to get along and be liked I tend to be what people expect me to be	Professional	1.70	0.78	1.75	0.82	
	Liberal Arts	1.75	0.73	1.55	0.79	*
	Total	1.73	0.75	1.65	0.81	
I am uncertain about what I am really like	Professional	2.23	0.97	2.01	0.96	*
	Liberal Arts	2.27	0.91	1.96	0.97	*
	Total	2.25	0.94	1.98	0.97	*
My confidence in myself is strong enough so that it doesn't bother me if people don't like me	Professional	2.85	0.88	3.04	0.84	*
	Liberal Arts	2.83	0.89	3.05	0.82	*
	Total	2.84	0.89	3.05	0.83	*
I seem to have inner strength in handling things	Professional	3.04	0.70	3.22	0.72	*
	Liberal Arts	2.98	0.66	3.19	0.76	*
	Total	3.01	0.68	3.20	0.74	*
I feel that I am a person of worth on an equal plane with others	Professional	3.49	0.64	3.61	0.63	*
	Liberal Arts	3.46	0.61	3.57	0.68	*
	Total	3.47	0.62	3.59	0.66	*
My religious beliefs are an important part of my life	Professional	2.52	1.15	2.45	1.19	
	Liberal Arts	2.62	1.18	2.46	1.20	*
	Total	2.57	1.17	2.45	1.19	*
Many times I feel that I have little influence over the things that happen to me	Professional	2.20	0.81	2.15	0.86	
	Liberal Arts	2.34	0.85	2.10	0.88	*
	Total	2.27	0.83	2.12	0.87	*
I am fairly certain that I will get a good job if I desire one	Professional	3.59	0.58	3.71	0.58	*
	Liberal Arts	3.35	0.72	3.41	0.79	
	Total	3.46	0.67	3.55	0.72	*
I am shy about making new friends	Professional	2.26	0.93	2.10	1.00	*
	Liberal Arts	2.09	0.88	2.06	1.00	
	Total	2.17	0.91	2.08	1.00	*
I usually give directions in a group	Professional	2.74	0.87	3.04	0.76	*
	Liberal Arts	2.73	0.81	2.87	0.76	*
	Total	2.73	0.84	2.95	0.76	*
I am quite aware of different philosophies, cultures, and ways of life	Professional	3.10	0.75	3.22	0.82	
	Liberal Arts	3.27	0.73	3.43	0.74	*
	Total	3.19	0.74	3.33	0.78	*
I enjoy myself most when I am alone	Professional	2.38	0.78	2.21	0.84	*
	Liberal Arts	2.32	0.86	2.29	0.83	
	Total	2.35	0.82	2.26	0.84	
I have participated in social action programs that were linked to my religious beliefs	Professional	2.13	1.12	1.87	1.13	*
	Liberal Arts	2.13	1.12	1.75	1.05	*
	Total	2.13	1.12	1.81	1.08	*
I discussed national and world political problems	Professional	1.75	0.43	1.92	0.27	*
	Liberal Arts	1.79	0.41	1.93	0.32	*
	Total	1.77	0.42	1.93	0.30	*
I attended one or more stage plays or read a play	Professional	1.65	0.48	1.64	0.48	
	Liberal Arts	1.74	0.44	1.65	0.52	*
	Total	1.70	0.46	1.64	0.50	
I read one or more contemporary novels	Professional	1.73	0.45	1.72	0.45	
	Liberal Arts	1.81	0.40	1.89	0.37	*
	Total	1.77	0.42	1.81	0.42	

I discussed philosophy or religion with friends	Professional	1.90	0.30	1.92	0.27	
	Liberal Arts	1.92	0.27	1.98	0.25	*
	Total	1.91	0.28	1.95	0.26	*
I attended a scientific lecture or exhibit	Professional	1.45	0.50	1.57	0.50	*
	Liberal Arts	1.49	0.50	1.66	0.51	*
	Total	1.47	0.50	1.61	0.51	*
I read a technical journal	Professional	1.29	0.46	1.55	0.50	*
	Liberal Arts	1.22	0.42	1.45	0.54	*
	Total	1.25	0.44	1.50	0.52	*
I became an officer in a special interest group	Professional	1.26	0.44	1.47	0.50	*
	Liberal Arts	1.26	0.50	1.23	0.42	
	Total	1.26	0.44	1.34	0.48	*
I talked with my friends about people and cultural events of other countries, races, or ethnic groups	Professional	1.81	0.40	1.92	0.27	*
	Liberal Arts	1.84	0.37	1.97	0.26	*
	Total	1.83	0.38	1.95	0.26	*
I read regularily Time or Newsweek or a daily newspaper on national events	Professional	1.73	0.45	1.87	0.34	*
	Liberal Arts	1.70	0.46	1.83	0.38	*
	Total	1.71	0.45	1.85	0.36	*
I volunteered in the community for a non-profit organization	Professional	1.46	0.50	1.43	0.50	
	Liberal Arts	1.50	0.50	1.39	0.49	*
	Total	1.48	0.50	1.41	0.49	*
I circulated a petition for a cause I believed in	Professional	1.09	0.29	1.16	0.37	*
	Liberal Arts	1.15	0.35	1.15	0.40	
	Total	1.12	0.33	1.15	0.39	
Problem solving factor scale	Professional	18.25	3.21	18.92	3.21	*
	Liberal Arts	18.77	3.02	19.72	2.98	*
	Total	18.53	3.12	19.35	3.11	*
Critical thinking factor scale	Professional	8.78	1.75	9.42	1.71	*
	Liberal Arts	8.88	1.75	9.39	1.58	*
	Total	8.83	1.75	9.41	1.64	*
Individual self-confidence factor scale	Professional	12.13	2.26	12.55	2.54	*
	Liberal Arts	12.00	2.05	12.58	2.45	*
	Total	12.06	2.15	12.57	2.49	*
Religiousness factor scale	Professional	4.65	2.04	4.30	1.98	*
	Liberal Arts	4.76	2.07	4.19	1.92	*
	Total	4.71	2.05	4.24	1.95	*
Importance of cultural goal factor scale	Professional	11.90	2.48	11.35	2.89	*
	Liberal Arts	12.71	2.30	12.53	2.64	
	Total	12.33	2.42	11.98	2.81	*
Patticipation in scientific activities factor scale	Professional	2.72	0.78	3.11	0.84	*
	Liberal Arts	2.71	0.74	3.10	0.91	*
	Total	2.71	0.76	3.11	0.88	*
Participated in discussion about political, philosophical, and cultural issues factor scale	Professional	5.47	0.76	5.77	0.60	*
	Liberal Arts	5.55	0.71	5.87	0.63	*
	Total	5.51	0.74	5.83	0.62	*

Table 3

PARTIAL CORRELATION COEFFICIENTS[1], AND MEAN RESIDUAL VALUES FOR OUTPUT VARIABLES RETAINED IN STEP TWO OF THE ANALYSIS

	Partial r	Professional Mean	Liberal Arts Mean	t-test
To obtain marketable skills	0.29*	0.25	-0.22	**
To understand the social sciences	0.22*	-0.18	0.16	**
To apply knowledge to new situations	0.12*	-0.07	0.06	**
To develop leadership	0.13*	0.10	-0.08	**
I enjoy solving long complex problems	0.13*	0.11	-0.11	**
I appreciate original work	0.15*	-0.09	0.07	**
In order to get along, I tend to be what people expect me to be	0.13*	0.11	-0.09	**
I am certain that I will find a good job if I desire one	0.16*	0.12	-0.09	**
I usually give directions in group activities and projects	0.12*	0.09	-0.07	**
I read one or more contemporary novels	0.19*	-0.08	0.07	**
I attended a scientific lecture or exhibit	0.13*	-0.03	0.09	**
I was an officer in student government or special interest group	0.26*	0.13	-0.11	**
Process of problem solving factor scale	0.12*	-0.33	0.29	**
Importance of cultural goals factor scale	0.14*	-0.35	0.31	**
	* $p<.05$			** $p<.05$

[1]Correlation between output variable and program type controlling for input variables